Remarks

This response is accompanied by a Request For Continued Examination and the associated fee. Accordingly, entry of this Amendment and reconsideration of this application are respectfully requested.

By this Amendment, independent claims 1 and 9 are being amended to more particularly point out and distinctly claim the subject invention, and dependent claims 2 and 10 are being amended for consistency with their respective independent claim. The addition of "new matter" has been scrupulously avoided. Claims 1 – 16 remain in this case.

The Examiner rejected independent claims 1 and 9 of the instant application in view of Colomes et al. under 35 USC 102(a). The Applicants note that all other claims pending in the application depend, either directly or indirectly, from these claims, and as such, focus is placed on the patentability of the independent claims.

Applicants respectfully disagree with the Examiner's characterization of the teachings of the Colomes reference. Applicant agrees that the Colomes reference teaches an artificial ear that is similar to the peripheral ear processor referred to in claims 1 and 9. However, the independent claims, as now presented, include limitations not taught or suggested by the Colomes reference.

Applicants note that the Colomes reference teaches a peripheral ear processor that produces a signal that may be considered as an equivalent to the basilar excitation signal in claims 1 and 9. However, Colomes is not, in the main, directed to the creation of a comparative system. In section 3, Colomes does outline what an objective perceptual meter would entail although it is revealed that this is merely untested speculation. The objective perceptual meter of Colomes is intended to provide one single measure, a probability that an encoded audio signal will be recognized as different from the original source. To do this, Colomes uses two of the ear processors, one receiving the encoded signal, the other receiving the unmodified original signal. A comparator determines a difference signal between the signals, and a threshold test is then applied to determine if the difference signal exceeds a threshold. A probability of detection (disclosed as being a binary choice of 0 or 0.5) is assigned to each frame based on whether or not the threshold is exceeded. The frame based probabilities are then used to determine an overall probability that the difference will be detected.

Applicants note that the subject matter of claims 1 and 9 differs from the teachings of Colomes in a number of ways, as outlined below with specific reference to the claims and their limitations.

Claim 9 has been amended to recite, "a cognitive processor for processing the basilar degradation signal to determine a plurality of cognitive model components for providing an objective perceptual quality rating quantifying the perceptual difference between the reference audio signal and the target audio signal." Applicants submit that the Colomes references neither teaches nor teaches towards the system of claim 9 as amended.

Section 3 of the Colomes reference teaches towards the creation of an "objective perceptual meter" using the artificial ear detailed earlier in the Colomes paper. Applicants submit that the form and function of the system outlined in the Colomes paper differs significantly from that of the claimed invention.

Colomes teaches analyzing the difference between the reference and target audio signal to determine if they exceed a threshold (masking-level). When the difference exceeds the threshold, a probability of detection is assigned to that particular frame (as outlined in Section 1.5 of the Colomes reference). The difference between the two signals is the only input to this system, and is used in a product calculation to determine a probability that a listener will discern a difference between the audio.

Applicants note that in contrast to the system taught by Colomes, the system claimed in claim 9 requires a plurality of cognitive model components, whereas Colomes teaches the use of a single input, the difference between the two audio sources. Furthermore, Colomes provides only a probability that a listener will discern a difference between the reference and target audio, whereas the system of claim 9 provides "an objective perceptual quality rating quantifying the perceptual difference between the reference audio signal and the target audio signal."

Applicants recognize that at first a quality rating may appear to be similar to the probability value provided by Colomes, but notes that there are many key differences. Colomes discloses the use of a probabilistic function that compares the difference in the two signals to a masking level threshold. When the difference exceeds the threshold, Colomes considers the difference to have an effect on the detectability of the difference between the signals. A product function is then taken over all frames to determine the overall likelihood of difference detection.

The system of claim 9, as amended, does not consider the probability that the difference between the two signals will be detected. Instead, the system of amended claim 9 assigns an objective quality score based on the difference between the two signals. Applicants submit that there is a patentable difference between a probability of detection and an objective quality score.

Consider a musical sample that is mildly distorted over the entire sample length. So long as the distortion exceeds the threshold of Colomes, and the length of the sample is sufficiently long, the product function of Colomes used to statistically determine the likelihood of detection will approach 100%. Consider now a musical sample of the same length that is severely distorted. The objective perceptual meter of Colomes provides only the likelihood that a listener will detect the distortion. So long as the more severe distortion lasts the full length of the sample, the likelihood of detection will approach 100% in much the same fashion as the moderately distorted sample would. The likelihood of detection will be the same, as both samples are sufficiently distorted to ensure that a listener will detect the difference. The system of claim 9 provides an objective perceptual quality rating that quantifies the perceptual differences between the reference and target audio signals. Thus, the output of the system of claim 9 will categorize the severity of the distortion instead of the likelihood that the distortion will be noticed. This results in the mildly distorted audio signal receiving a score indicating that it is mildly distorted, while a severely distorted audio signal will receive a different score. These objective perceptual quality ratings are strongly correlated to the readings that sample audiences would assign according to standard practices.

Although the Colomes paper makes reference to tests making use of listening audiences, these passages of the Colomes paper relate only to a calibration used to adjust the sound-masking threshold, and do not provide Colomes with an objective perceptual quality rating.

Put another way, a severe level of distortion can be taken as implying that there is a high probability that the distortion will be noticed, but this mapping is not a one-to-one and onto mapping. Instead, while the severity of the distortion could potentially be mapped to a detection probability, the probability of listener detection cannot be mapped back to a quantitative quality rating such as that provided by the claimed system.

Applicants submit that the system of claim 9 is not anticipated by the teachings of Colomes, and accordingly requests that the rejection of claim 9 under 35 USC 102(a) be withdrawn.

With respect to claim 1, the Examiner indicated that claim 1 was simply the system of claim 9 restated in method form. Applicants have made amendments to claim 1 similar to those made to claim 9. Claim 1 now recites the steps of:

(iii) processing the basilar degradation signal according to a cognitive model to determine a plurality of cognitive model components; and

(iv) calculating an objective perceptual quality rating quantifying the perceptual difference between the reference audio signal and the target audio signal from the plurality of cognitive model components.

Applicants submit, that as outlined above, Colomes does not teach the use of a plurality of cognitive model components, nor does it teach the production of an objective perceptual quality rating quantifying the perceptual difference between the reference audio signal and the target audio signal. Applicants submit that claim 1 is not anticipated by the teachings of the Colomes reference, and as such, requests that the rejection under 35 USC 102(a) be withdrawn.

The Examiner has relied upon other references in conjunction with Colomes to reject other claims as obvious under 35 USC 103(a). Applicants submit, that although the ITU reference teaches the matter of claim's 1 and 9, it is not citable by the Examiner in this case against claims 1 and 9. Applicants submit that the Hollier reference cannot be combined with the teachings of Colomes to arrive at the matter claimed in claims 1 and 9. Specifically, Hollier teaches neither the use of a plurality of cognitive inputs nor the production of an objective perceptual quality rating. As such, Applicants submit that claims 1 and 9 overcome all cited art.

As all other claims depend from claims 1 and 9, either directly or indirectly, they also overcome all the cited references. As such, Applicants submit that the claims of the instant application are in condition for allowance.

With specific reference to some of the Examiner's other rejections, the examiner has characterized the Colomes reference as teaching many features of the dependent claims that it does not. In particular, Applicants note that the Examiner has characterized the Colomes reference as teaching the matter of claim 11, in particular as teaching the peripheral ear processor providing as an output a harmonic structure from an error spectrum obtained through a comparison of the reference and target audio signals. The Examiner has pointed to the application of a power density spectrum taught by Colomes starting at the last paragraph of page 236 and extending to the second paragraph of page 237.

Applicants have reviewed the referenced section of the Colomes paper. This section deals with adjusting the mathematical parameters of the artificial ear so that it matches test results. The term harmonic structure is used in the application (see the last paragraph on page 9 through the third paragraph on page 10) to relate to the structure of the spectrum of an error obtained through a comparison of the target and reference audio signals. The power density spectrum referred to in Colomes is not passed to another component, and is in fact only externally computed in the calibration of co-efficients for the artificial ear. The adjustment of the white noise levels is made until they exceed a perceptible level, and then the value is stored. The value is used in the determination of the masking threshold that is provided to the artificial ear as a static construct. As a result, no equivalent to the harmonic structure is actually taught in the Colomes reference, and the rejection of claims 11 and 3, is invalid and should be withdrawn.

For all of the above reasons, the claims in this application are believed to be in condition for allowance, and such action is respectfully requested.

If it would advance the prosecution of this application, the Examiner is invited to contact applicant's representative at the below listed telephone number.

Respectfully submitted,

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Dated: October 14, 2005

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